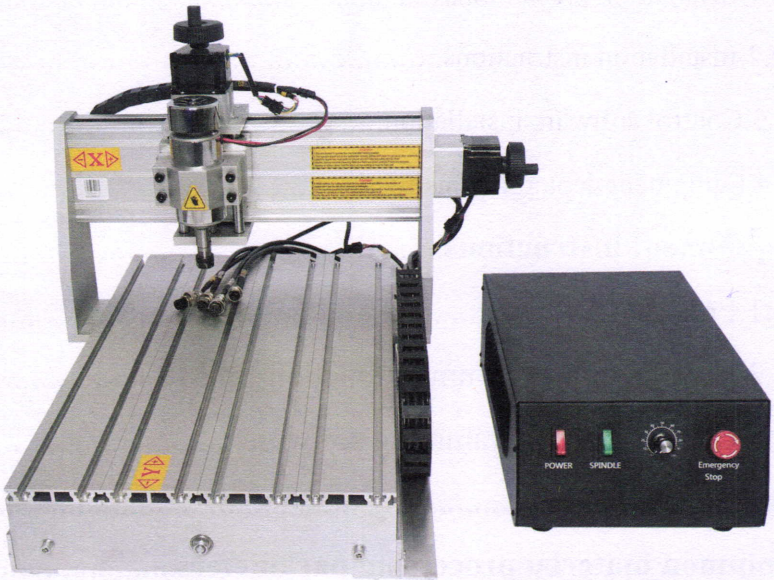
Operation Manual

CNC 3020/3040/4060

Small CNC User Manual

Applicable Model：CNC3020/3040/4060 model



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Foreword

First of all, thank you for purchasing and using our products. Please read this instruction before installing your machine, so as not to cause unnecessary trouble for your installation and use.

The equipment is tested before leaving the factory and meets the shipping standards. Before using, please read the following precautions carefully:

1. The machine has been rigorously tested before leaving the factory to ensure that all functions of the machine are in good condition, but the machine must be transported by logistics. When receiving the goods,please make sure that the outer packaging of the product is complete and unpacking. Please check the goods afterwards. If there is any problem, please contact the after-sales personnel in time;

2. The machine is connected with the computer by USB, the computer used for control should be dedicated, and as far as possible, do not install other unrelated application software;

3.Please ensure that there is a grounding function for the power supply socket. If there is no grounding, please perform external grounding.

4. This unit uses single-phase AC 220V, 50Hz (single-phase AC110V, 50/60Hz in some areas), if not allowed, please Do not disassemble it in order to avoid danger;

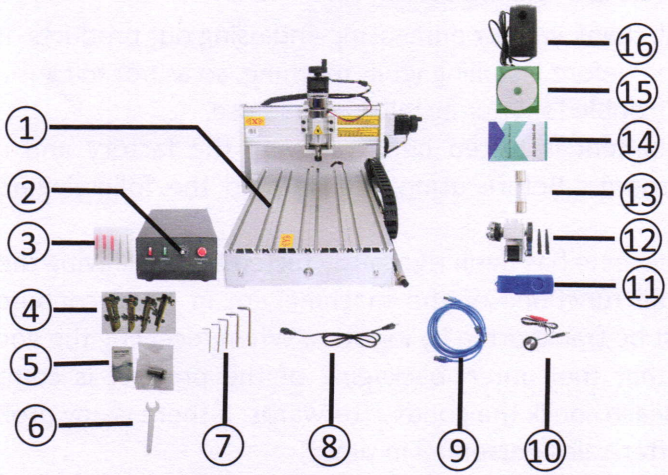
5. When processing, it is relatively large when it comes to cutting chips. Especially when processing metal materials, please wear protective glasses to prevent metal chips from flying out and hurt your eyes.

6. Do not approach the spindle rotating at high speed during machining. Do not touch the workpiece being processed by hand to avoid danger.

7.If accidents are found during work, please turn off the power in time and wait for a while before re-use. If the problem is still not solved, please contact the after-sales personnel.

1.Engraving overview

1.1.Equipment packing list



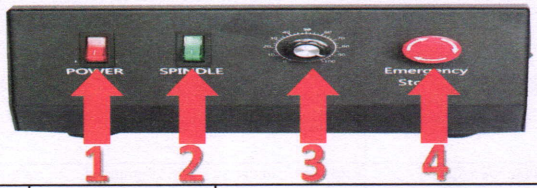
(1).CNC Engraving machine rack----1 units
(2).CNC Engraving machine control box----1 units
(3).Test machine carving knife----5 Put
(4).Fixed clamp----4 sets
(5).Spindle chuck----1PC
(6).Spindle wrench----1 pair
(7). Allen wrench----5 put
(8). power cable----1 Articles
(9).USB cable----1 Articals
(10).Tool set----1 PC
(11).U disk ----1PC
(12).The axis of rotation----1 PC
(13).The fuse----2PC
(14).Operation manual ----1 PC
(15).software CD----1 PC
(16).Engraving machine spindle cooling pump----1 units (4060 model)

The above items are the packing list when the machine is shipped as standard. The specific goods are subject to the purchase.

If there is any missing item, please contact customer service.

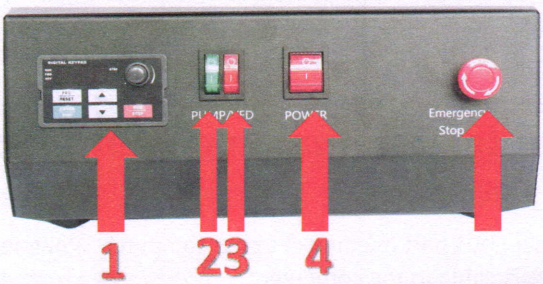
1.2.Names and functions of various parts of the equipment

Electric control box
switch description
3020/3040 model



Label	Button name	Key Function
1	switch	Control the power supply of the electric control box
2	Spindle start switch	Control spindle start and stop
3	Spindle speed control knob	Adjust the spindle switch and spindle speed
4	Emergency stop button	Pressing the machine in an emergency will stop immediately

4060 model



Label	name	Key Function
1	Spindle panel	Display spindle status
2	Water pump switch	Control the start and stop of the spindle cooling water pump
3	Spindle start switch	Control spindle start and stop
4	switch	Control the power of the control box
5	Emergency stop switch	Pressing the machine in an emergency will stop immediately

1.3.Equipment technical parameters

SKU	E-3020E-3020A	E-3040E-3040A	E-4060E-4060A
Chinese name	3020 3 axis / 4 axis	3020 3 axis / 4 axis	6040 3 axis / 4 axis
Effective work schedule	200(X)x300(Y)x55(Z)mm	300(X)x400(Y)x55(Z)mm	395(X)x600(Y)x70(Z)mm
Effective work schedule	500*390*390(H)mm	610*450*390(H)mm	840*640*460(H)mm
Maximum thickness ofmaterial	≤65mm	≤65mm	≤100mm
Maximum workpiece size	240mm * 425mm	320mm * 525mm	750mm * 480mm
working desk size	240mm * 425mm * 15mm	320mm * 525mm * 15mm	750mm * 480mm * 15mm
Frame material	6061 aluminum alloy + 6063aluminum alloy	6061 aluminum alloy + 6063aluminum alloy	6061 aluminum alloy + 6063aluminum alloy
Drive unit (X/Y/Z)	1202 Trapezoidal screw	1202 Trapezoidal screw	New 1605 ball screw
Sliding unit X axis	16mm Chrome plated hard shaft	16mm Chrome plated hard shaft	16mm Chrome plated hard shaft
Slide unit Y axis	16mm Chrome plated hard shaft	16mm Chrome plated hard shaft	20mm Aluminum support opticalaxis slide
Sliding unit Z axis	12mm Chrome plated hard shaft	12mm Chrome plated hard shaft	13mm Chrome plated hard shaft
Stepper motor type	57 2-phase stepper motor -2A	57 2-phase stepper motor -2A	57 2-phase stepper motor -3A
Spindle motor	300W DC	300w DC	800w New water cooled spindle
Spindle speed	0~8000rpm/ min（Stepless speedregulation）	0~8000rpm / min（Stepless speedregulation）	0~24000rpm/min（ Frequencyconverter speed regulation）
Airspeed	0-1000mm / min	0-1000mm / min	0-2500mm / min
Engraving speed	0-1000mm / min（ Differentmaterials）	-1000mm / min（ Differentmaterials）	0-2000mm / min（ Differentmaterials）
Repeatability	≤0.05mm	≤0.05mm	≤0.03mm
Machine weight	21.5KG/23.5KG	25.5KG/27.5KG	51KG/59KG

2.Equipment installation and commissioning

2.1.Installation precautions

(1).This machine uses a USB port to connect to the computer. When installing, you need to connect the USB cable to the computer.

(2).The computer used for control should be dedicated. Do not install other unrelated application software and anti-virus software as much as possible. Also, do not connect to the network. Viruses and other application software may affect the operation of the machine.

(3).The machine adopts single-phase A C 220V, 50Hz power supply (single-phase A C 110V, 5 0 / 60 0 z z in some areas), please ensure the correct and stable supply voltage;

(4).Since the machine has a frequency converter, the inverter will generate a lot of static electricity during operation. Please ensure that the grounding function of the power supply socket of the equipment is normal. If it is not grounded, it will affect the life and normal operation of the machine.

(5).Please be sure to follow the steps of the engraving machine installation instructions during installation. The installation may cause the machine to malfunction due to incorrect installation by the user.

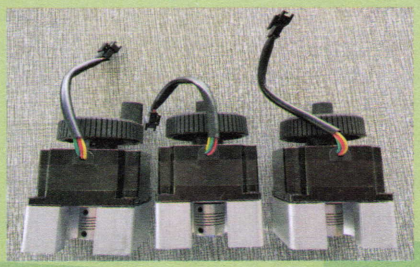
(6).If there is an y problem with the operation of the machine during the machine debugging process, please contact the after-sales personnel for disposal. Do not disassemble it without permission, so as to avoid danger;

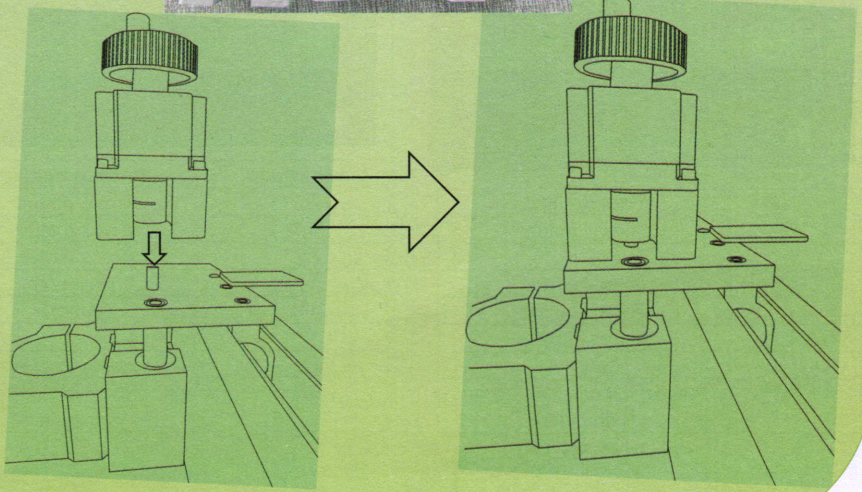
(7).Do not plug or unplug the terminal at any time while powering on. At the same time, please note that the interval between the power on and off of the device should be above 15S. If you do not pay attention to the above problems, it may cause damage to the control circuit.

2.2.Installation instructions

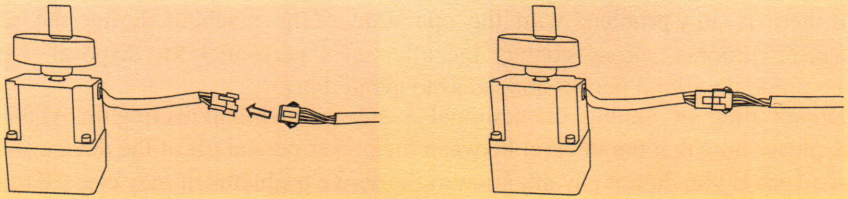
The machine can be installed by following the instructions below.

Step 1: Install the motor, and install the stepping motors of the three axes to the corresponding shafts. The locking screws on the couplings are tightened with the Allen key.





Step 2: Align the wire plug on the motor with the corresponding plug on the machine.

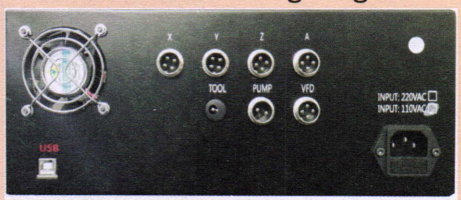


Step 3: Connect the engraving machine frame, electric control box and computer wiring (refer to the wiring diagram for connection). The aerial plug-in cable is connected between the rack and the electric control box. The connection will be affixed with X, Y, Z, A (purchasing A-axis), spindle, spindle cooling water pump (4060 model) corresponding to the aviation plug and The interfaces with the same identification after the electric control box are connected one by one. Connect the USB cable between the electric control box and the computer. Be sure to connect the wiring. Otherwise, the computer will not be able to control the machine. Finally, connect the power cable.

3020/3040 model wiring diagram

Label name	Port description
X	X-axis motor
Y	Y-axis motor
Z	Z-axis motor
A	A-axis motor
SPINDLE	Spindle motor
TOOL	Tool set
USB	Connect the data cable to the computer

4060 model wiring diagram



Label name	Port description
X	X-axis motor
Y	Y-axis motor
Z	Z-axis motor
A	A-axis motor
TOOL	Tool set
PUMP	Spindle motor cooling water pump
VFD	Frequency conversion spindle
USB	Connect the data cable to the computer

2.3.Control software installation

Software installation computer requirements:

1. desktop computer or laptop;
2. USB port;
3. computer system:WindowsXP/Win7/win8/win10 system;

Our company provides Mach 3 software for testing and testing. It is only for teaching and personal research. If there is any commercial use, please buy genuine, thank you! Mach 3 official website: www.machsupport.com

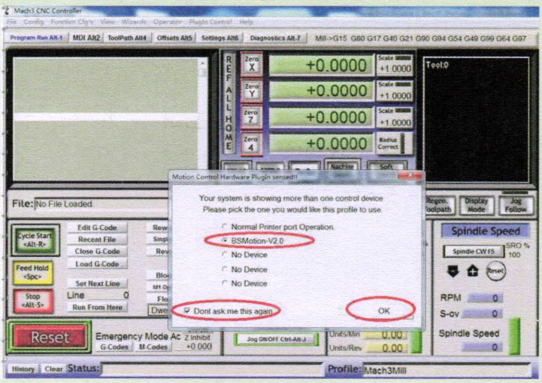
Basic installation of Mach3 software: Please open the supplied USB flash drive and find the installation folder.

Please confirm that the USB cable is connected before the software is installed. Software installation steps: Double click Setup .

Open into the installation interface, and then press the Enter key "Enter", "Next" or "YES" until The "Finish" installation is complete: Mach3 Engraving Machine Instruction.pdf > Setup · Next > Yes > Next > Next > Next > Next > Determine > Finish > Determine > Next > Yes > Next > Next > Next > Next >Yes > Finish.

2.4.Equipment debugging instructions

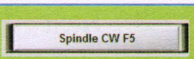
Step 1: Double-click Mach3Mill to enter the software and wait for the software software interface to load. The first time you start the software, the computer will pop up the following dialog box, please select "BSMotion-V2.0", "Don't ask me this again" , "OK"



Step 2: Power on the control box and switch the power switch to ON. At this time, the emergency reset button "Reset" in the lower left corner of the computer control interface is flashing.

Click the "Reset" button to cancel the alarm state.

Step 3: After confirming that the emergency reset in the lower left corner is not flashing, use the arrow keys on the keyboard and Pageup/down to control the left and right, front and rear, and up and down movements of the machine to confirm that the machine movement function is normal.

Step 4: Then click 

on the spindle speed bar in the lower right corner of the Mach3 software. At this time, the spindle will rotate, indicating that the spindle speed control function is normal (make sure the spindle nut is tightened before turning on the speed).

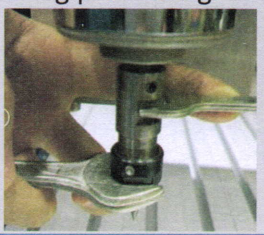
After the above simple debugging, the machine functions are normal. If you encounter problems, you can consult the after-sales solution.

3.Equipment instructions

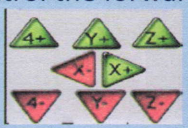
3.1.Processing flow

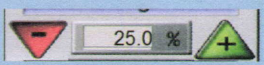
Step 1: the material to be processed is fixed on the machine with the corresponding fixture. Generally, the thin plate is fixed by double-sided glue, the rectangle is fixed by a vise, and the shaped workpiece is fixed by a special fixture.

Step 2: Clamp the tool onto the spindle motor. When clamping the tool, it is necessary to pay attention to the specifications of the clamping tool. It must be the same as the programming time. The tool should be locked with the spindle wrench. After the tool is clamped, it must be checked whether the tool will be yawed. Otherwise, the quality of the processed product will be poor. Broken knives, etc. during processing.



Step 3: Open the control software Mach3 on the computer, turn on the machine power switch, and release the alarm state.

Step 4: manual tool setting operation, press the keyboard "Tab" on the computer operation interface to call up the "MPG" interface, click the corresponding button to control the forward/reverse movement of the machine in the current axis. 

by 

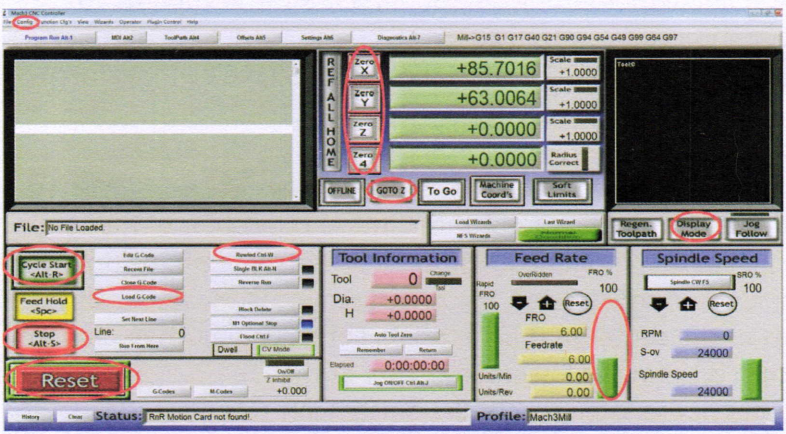
To control the speed of the movement, move the center of the tool nose to the machining coordinate origin set during programming (for the convenience of tool setting, the programming is usually set at the four corners or the center of the material). For example, when programming, the origin is set in the lower left corner of the material, then we will align the center of the tool tip with the bottom left corner of the material with the hand wheel (the spindle speed should be adjusted to about 30% when the tool is set to prevent the tool from breaking. Knife).

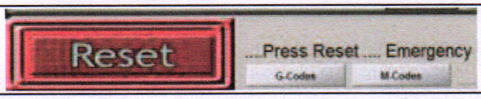
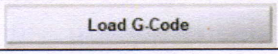
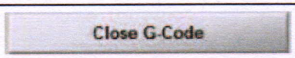
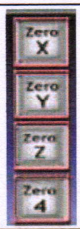
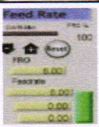
Step 5: Confirm that the "Emergency Reset" in the lower left corner of the software is not flashing. Click "Zero X", "Zero Y", "Zero Z", "Zero A", click "Load G Code", then there will be loading. G code pop-up window, file type select "AllFiles" and find the G code you generated is loaded. After the loading is completed, the corresponding simulation path will be displayed in the upper right corner of the software (if there is no simulation path generation, the loaded G code is wrong or Can't identify it).

Step 6: After the program is read in, adjust the spindle speed to 80%~100% (the spindle speed is set according to the processing material), then click "Start" to process the machine. If it needs to be adjusted during the machining process. The speed of the machining can be controlled by pulling the column bar of the feed bar.

The above is a simple operation method. For details on the control software, please refer to "Using Mach3Mill".

3.2.Introduction to common functions of Mach3



Button name	Button icon	Key Function
Emergency reset		Whenalarming,clickthisbutton to cancel thealarm.
Load G code		Click this button to import the G code file.
The program starts running		After importing the G code file,Click this button to start running the program.
Return to program beginning		Clickthisbuttontoreturntothe beginningoftheprogramand re-run.
Turn off G code		Close G code file
XYZA coordinate clear		Afterusingthecorrectorigin beforemachining,weneedto clickXYZAtoclearinmach3, thatis,settheworkpiecezero coordinate;
Return to origin		Clickthisbuttontoreturntothe origincoordinates.
Processing feed speed adjustment		If you need to adjust the processing speed during machining,youcanclickthis columntoadjustthemachining feedspeed.
Display mode		Flat 2D mode and stereo 3D mode display Show the processing path, click this button to switch the display status
Offline function		Ifyouneedtocheckthestarting point or running status of the program, you can click this button to perform offline simulation. After offlinelighting, reconnect the machine and remembertoswitchback.Otherwise, the computer cannot control the machine.
Jog on/off		Similar to a child lock function, when you click this button, the computer keyboard will not be able to control the machine, and the program can still run online.

3.3.Compatible programming software

Mach3 is a PC software that recognizes international G code and is currently compatible with most software that generates G code on the market. Since the user's purchase of the machine is not the same, here are some recommended G code generation software for common use.

For two-dimensional processing applications such as engraving, milling, drilling, and cutting, it is recommended to use Wentai, ArtCAM, Beijing Jinghua software, Type3 and other software, they are compatible with DXF format files.

PCB board engraving is recommended to use CopperCAM software and is compatible with Gerber files.

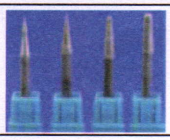
Engraving relief is recommended to use ArtCAM and Beijing carving software, ArtCAM is suitable for novice learning, Beijing carving The software is more professional.

UG, MasterCAM, and Powermill are recommended for processing such as molds, fixtures, and parts. Four-axis stereo processing is recommended to use Powermill and Beijing Engraving software to make getting started easie

4. Tool selection

Commonly used tool classification for engraving machines: milling cutters, engraving knives, drill bits, chamfering knives, ball knives, etc. The tool usually consists of a shank and a blade. The shank is the part that is clamped and has no cutting ability. The blade is the part with cutting ability.

List of commonly used tool types

Tool type	Tool name	Tool picture	Tool function	usual format
Milling cutter	Corn milling cutter		Mainly used for milling grooves of non-metallic materials such as high temperature resistant plastics and wood.	Common specifications for tool holders: 3.175 and 4mmCommon specifications of the blade: 0.6-3.175mm
	Single-edged milling cutter		For the cutting of plastic, copper, aluminum alloy and other materials, milling	Common specifications of the toolholder: 3.175 bladecommon specifications: 1,2, 3mm
	Three-blade milling cutter		Processing aluminum alloy, copper and other materials, milling and milling, can also be used for processing non-metal bakelite, plastics,etc.	Common specifications of the shank:3.175 and 6mm blades commonly used Specifications:1,1.5,2,2.5,3,3.5,4,5,6mm
Carving knife	Flat bottom taper carving knife		Generally used for engraving PCB board engraving, metal lettering, embossing process processing and so on.	Common specifications of the tool holder: 3.175, 4, 6mm bladeCommonspecifications: 20°0.1, 0.2, 0.3,30°0.1,0.2, 0.3, 0.4
Drill class	High speedPCBdrill head		Suitable for PCB board drilling, or plastic and other holes,larger specifications, can also drill aluminum alloy materials	Common specifications of the shank: 3.175mm blade commonly used Specifications: 0.3-3, 4, 5, 6mm
Ball knife	Ball knife		Used for the processing of some curved spherical surfaces such as plastic, wood and metal.	
Grinding head	Jade grinding head		For the grinding of jade materials	Tool holder common specifications: 3.175mm

5. Common material processing parameters

Material name	Processing parameters			
	Eat the amount of knife (mm)	Lower knife speed (mm/min)	Cutting speed (mm/min)	Spindle speed (r/min)
wood	2	500	1000	20000
Acrylic	1	500	800	16000
PVC	1	500	800	18000
PC	1	500	800	18000
ABS	0.5	500	800	18000
nylon	0.5	500	1000	20000
Double	1	500	1000	20000
Bakelite	1	500	1000	20000
Fiberglass panels	1	500	1000	20000
Mammoth	0.5	300	800	20000
Beeswax	0.5	300	800	20000
Bone/corner	0.5	300	800	20000
copper	0.25	400	800	20000
aluminum	0.25	400	1000	20000
silver	0.3	400	1000	20000
Zinc	0.2	400	800	20000
magnesium	0.2	400	800	20000
walnut	1	400	800	20000
Ivory fruit	1	400	800	20000
Bodhi	1	400	800	20000
synthetic rock	1	200	300	20000
Seal stone	1	200	300	20000
cobblestone	0.1	200	300	20000
jade	0.1	150	300	20000
Carbon fiber board	0.3	400	800	20000

The above data is a conservative parameter set by a 3.175mm milling cutter. For reference only, please adjust according to the actual situation.

6. Equipment service

(1) screw cleaning and lubrication

When the machine is in use, it is a good habit. It is necessary to do a cleaning work for about one month. The screw, optical axis and bearing cleaning must work. You can use a clean rag to manually wipe the optical axis of the screw. The part of the bearing that is not cleaned can be cleaned with a small brush. After cleaning, the oil can be sprayed with oil to the screw, the optical axis and the bearing, and then the machine can be moved back and forth for a few times, such as above the screw. There is also dirt, re-clean with a rag, repeat the lubrication and clean the action until the screw is shiny and oily.

(2) spindle cleaning and maintenance

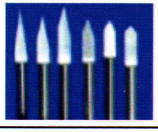
During the machining process, the spindle chuck, nut and screw parts are easy to enter dust and rust. At this time, it is necessary to apply anti-rust oil to the spindle clamping part to clean the rust of the screw; the chuck and nut are severely rusted. Replace the collet and nut to ensure that the machine is concentric.

(3) electric control box cleaning

When the controller is used with the machine, sometimes it will enter a lot of dust. When processing metal materials, it is necessary to clean the dust inside the control box to prevent conduction and burn out the circuit. We can open the cover of the controller, use a hair dryer, open the cold air stall, turn the control box upside down, clean the dust on the circuit board, and clean it, clean it with a small brush.

(4) common consumables replacement

Shaft nuts, chucks, knives, stepper motor couplings, lubricants, etc., please contact

Supplies Name	Consumables Picture	Supplies Features
Spindle nut		On the clamping spindle, use the locking tool with the tool chuck
Tool chuck		On the clamping spindle, use the locking tool with the tool nut
Tool		Engraving tools such as engraving knives, milling cutters, drill bits, etc.